Ratio. But Mister Cube, this fellow here whom we commonly call Mister Square, wants me to move a Square *up* and find the Third Dimension. Baron! [*Dramatically.*] I feel as though I were on the point of making some wonderful new discovery! Something that will help our future generations to live freer, happier lives than ours have been. Something that will ——

Baron Multilatus. Enough of this, my man! I fear you are becoming mentally unbalanced. You'll only end by being burned as a heretic. And if you continue in this fanatical idea of yours I myself shall see that you get your just punishment. Come along, Cyclus—We'll seek a better master, and a saner one.

[*Exeunt Baron Multilatus with Cyclus.*]

Ratio. [*Musing.*] He thinks I'm crazy, does he? Well, well, perhaps I am,—but we'll see. We'll see. [*To Cube.*] And now, friend Cube, I'm off to my fellow-masters to see if I can get any help in this miraculous problem you have suggested. Doubtless they, too, will think me mad. Oh, when will the world learn to respect a man who is seeking after new truths? But—I'll meet you later, sir, and perhaps then we can bring happiness to my poor people. [*Exit Ratio.*]

Epilogue.

Spoken by Cube.

And thus, my friends, this demonstration
Portrays a grievous situation—
A people who would like to find
A way to educate the mind,
And yet, who miss inevitably
A truth we know quite naturally.
And, sometimes, when I contemplate
Their ignorance so desolate
I wonder if *we* fail to see
Some evident reality.
And so, I bring to your attention
The subject of the Fourth Dimension.

PROBLEMS AND SOLUTIONS.

EDITED BY B. F. FINKEL AND OTTO DUNKEL.

Send all communications about problems to B. F. FINKEL, Springfield, Mo.

PROBLEMS FOR SOLUTION.

2776. Proposed by C. P. SOUSLEY, State College, Penn.

Prove by elementary geometry that the Wallace lines of the extremities of any diameter of the circumscribed circle of a triangle intersect at right angles on the nine-point circle of the triangle.

2777. Proposed by W. D. CAIRNS, Oberlin College.

Prove that the two series

$$1 + \frac{\pi^4}{2^4 \cdot 4!} + \frac{\pi^8}{2^8 \cdot 8!} + \cdots,$$

and

$$\frac{\pi^2}{2^2 \cdot 2!} + \frac{\pi^6}{2^6 \cdot 6!} + \frac{\pi^{10}}{2^{10} \cdot 10!} + \cdots$$

are equal.

2778. Proposed by WARREN WEAVER, University of Wisconsin.

A partition of space is effected by means of five planes, none of which are parallel and no four of which pass through the same point, and six spheres. This divides all space into n regions, some of which are finite and some infinite. Considering it equally probable that a bird be in any one of the n regions show that the probability of its being caught (that is, of its being in one of the finite regions) is equal to or less than 78/99.

2779. Proposed by J. L. RILEY, Junior Agricultural and Mechanics College, Stephenville, Texas.

A parabola is placed with its axis horizontal; find the straight line of shortest descent from the curve to the focus.

406 (Algebra) [March, 1914]. Proposed by S. A. COREY, Albia, Iowa.

Solve the system of equations:

$$(1 - x)(a_1 + a_2y + a_3z) = d, \quad (1 - y)(b_1 + b_2x + b_3z) = g, \quad (1 - z)(c_1 + c_2x + c_3y) = h.$$

411 (Algebra) [April, 1914]. Proposed by V. M. SPUNAR, Chicago, Ill.

Determine $x_1, x_2, x_3, \cdots x_p$, from the equations:

$$\begin{aligned} x_1 + x_2 + x_3 + \cdots + x_p &= a_0, \\ b_1x_1 + b_2x_2 + b_3x_3 + \cdots + b_px_p &= a_1, \\ b_1^2x_1 + b_2^2x_2 + b_3^2x_3 + \cdots + b_p^2x_p &= a_2, \\ \cdots\cdots\cdots\cdots\cdots\cdots & \\ b_1^{p-1}x_1 + b_2^{p-1}x_2 + b_3^{p-1}x_3 + \cdots + b_p^{p-1}x_p &= a_{p-1}. \end{aligned}$$

442 (Geometry) [May, 1914]. Proposed by J. B. SMITH, Hampden-Sidney College.

If any three straight lines AD, BE, CF, be drawn from the corners of the triangle ABC to the opposite sides a, b, c, they will enclose an area. If Δ, Δ'' be the areas of the triangles ABC, DEF, show that

$$\frac{\Delta''}{\Delta} = \frac{(AF \cdot BD \cdot CE - AE \cdot CD \cdot BF)^2}{(ab - CE \cdot CD)(bc - AE \cdot AF)(ca - BF \cdot BD)},$$

where the signs of the factors are to be determined by the following rule: Each segment being measured from one of the corners of the triangle ABC, along one of the sides, is to be regarded as positive or negative according as it is drawn towards or from the other corner in that side.

455 (Geometry) [February, 1915]. Proposed by R. P. BAKER, University of Iowa.

Find the minimum triangle of assigned angles inscribed in a given triangle.

348 (Calculus) [December, 1913]. Proposed by E. L. DODD, University of Texas.

Let $(x_1, x_2, \cdots x_n)$ be a point in n dimensions lying in the "sphere" S defined by

$$x_1^2 + x_2^2 + \cdots + x_n^2 \leqq 1.$$

Let T be that part of S defined by a set of n linear homogeneous inequalities with non-vanishing determinant; thus:

$$a_ix_1 + b_ix_2 + \cdots + k_ix_n \geqq 0, \quad i = 1, 2, \cdots n.$$

Find the value of